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RAISED SHEET

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## Abstract

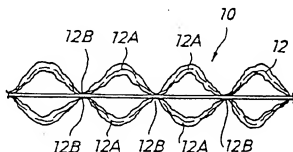
## Objective

To provide a favorable raised sheet as a cleaning sheet, etc., having superior adsorption ability and ability to hold dirt such as fine dust, etc., superior ability to capture hair, pieces of thread, cotton dust, etc., resulting from the tying of fibers in a nonwoven fabric of high releasability and able to capture large dirt such as bread crumbs, etc., utilizing the

irregularities of the nonwoven fabric, superior fiber fallout resistance, and favorable flexibility, etc.

### Constitution

The raised sheet of the present invention is characterized by the fact that fiber aggregates of a nonwoven fabric formed by entangling fibers are bonded to one or both sides of a net-like sheet in an entangled state with even said net-like sheet along with entangling between the compositional fibers, many irregular parts are formed in the side of said fiber aggregate, and the compositional fibers of the fiber aggregate entangled on at least one side of said net-like sheet include heat-fusible fibers.



### Claims

1. A raised sheet, characterized by the fact that the entangled areas of fiber aggregates of a nonwoven fiber obtained by entangling (a number of) fibers are bonded to one or both sides of a net-like sheet to form an on-piece material, that the

surface of the aforementioned fiber aggregates is very irregular, and that the fibers that form the fiber aggregates to be bonded to at least one side of the aforementioned net-like sheet form a heat-fusible fiber.

2. The raised sheet according to Claim 1, characterized by the fact that the fibers that form the fiber aggregates to be bonded onto at least one side of the aforementioned net-like sheet are comprised of 1-99 wt% of a heat-fusible fiber.

3. The raised sheet according to Claim 1 or 2, characterized by the fact that 0.1-500 wt% (in reference to the weight of the fiber aggregates) of a chemical can be loaded onto the aforementioned fiber aggregates.

4. The raised sheet according to Claim 1, 2 or 3, characterized by the fact that the aforementioned net-like sheet is heat-shrinkable sheet, and the surface of the aforementioned fiber aggregates becomes irregular when the aforementioned net-like sheet is subjected to a heat treatment.

#### Detailed explanation of the invention

[0001]

#### Industrial application field

The present invention relates to a raised sheet in which the side of the sheet is formed with irregular shapes. In particular, it relates to a raised sheet used for industrial or household

cleaning products (cleaning sheets), wiping material, side material for sanitary napkins, cushion material, etc.

[0002]

Prior art

As cleaning products (cleaning sheets), there are dust cloths, which are wet or dry cleaning cloths that use a woven or nonwoven fabric as the base member, chemical dust cloths which are impregnated with an oily substance in a flat woven or nonwoven fabric, that which has bundled yarn-like material and used in the wet or dry state like a mop, etc., and these cleaning products are used widely at homes, offices, stores, buildings, plants, etc. according to the objective.

[0003]

The conventional chemical dust cloth that is a cleaning product was generally impregnated with an oily substance in a flat woven or nonwoven fabric, but in order to enhance the performance, such as adsorption of the dirt on the side to be cleaned, dust absorption for removing dust, dust-holding ability for holding removed dirt, and damage prevention property of the cleaning side, using a soft raised nonwoven fabric as a material for the cleaning product has been proposed.

[0004]

As methods for raising the nonwoven fabric as a cleaning product, postprocessing such as stitching, etc., after the generic nonwoven fabric formation as noted in Kokai Patent Application No. Sho 64[1989]-61546, that which executes raising as noted in Kokai Patent Application No. Hei 2[1990]-124122, that which uses fibers capable of expanding or crimping one part or all fibers composing the nonwoven fabric as noted in Kokai Patent Application Nos. Hei 2[1990]-160962 and 2[1990]-191422, etc. can be cited.

[0005]

Also, the development of a raised nonwoven fabric is being executed even with regards to application in cushion material, packaging material, and side material for sanitary napkins, etc., in addition to cleaning products.

[0006]

Problems to be solved by the invention

However, the aforementioned raised nonwoven fabric has the following problems. In raising according to postprocessing, a generic nonwoven fabric or raising according to gigging, a large volume of nonwoven fabric and fiber source material has to be

used for manifesting the raised effect, and when cleaning is executed by applying pressure, the contact side [of the fabric] becomes fixed with the side to be cleaned and the nonwoven fabric and the fibers of the internal layer composing the apparent thickness of the nonwoven fabric as the cleaning product cannot come into contact with the side to be cleaned so the usability of the nonwoven fabric which is the base member is inefficient.

[0007]

Also, the method for generating raised irregularities utilizing the expanding and crimping properties of the fibers cannot obtain irregularities sufficient for capturing large dirt such as bread crumbs, etc., utilizing the irregularities of the nonwoven fabric though the absorption and holding ability of dirt such as fine dust, etc., improves in comparison with a generic flat nonwoven fabric.

[0008]

Also, when an oily substance is impregnated in the nonwoven fabric, there is a tendency to give a feeling of discomfort to the user due to the sticky feeling, such as the case of an oily substance impregnated in a generic flat nonwoven fabric.



[0009]

Raising of the cushion material using a nonwoven fabric noticeably decreases the releasability of the fibers in a nonwoven fabric due to adhesion and fusion, occurring when a nonwoven fabric such as film, etc., having height bestowing property is bonded to it. Nonwoven fabric as a generic cleaning product has a tendency to make the joining of the fibers firm so that the fiber scraps can not be output or torn off during the cleaning, but there is the problem of the decrease in the releasability of fibers in the nonwoven fabric reducing the collecting ability of hair, pieces of thread, cotton dust, etc., provided by the entangling effect of the fibers in a nonwoven fabric.

[0010]

Also, as a cleaning sheet, having superior fiber fallout resistance and difficulty of fallout (fiber fallout) of the fibers in the nonwoven fabric are necessary when hitched to projections, etc., of the side to be cleaned or according to friction between the side to be cleaned and the sheet side during the cleaning.

[0011]

Therefore, the objective of the present invention is to provide a favorable raised sheet as a cleaning sheet, etc., having superior adsorption ability and ability to hold dirt such as fine dust, etc., superior ability to capture hair, pieces of thread, cotton dust, etc., resulting from the entangling of fibers in a nonwoven fabric of high releasability and to capture large dirt such as bread crumbs, etc., utilizing the irregularities of the nonwoven fabric, superior fiber fallout resistance, and favorable flexibility, etc.

[0012]

Means to solve the problems

The present invention achieves said objective by providing a raised sheet characterized by the fact that nonwoven fiber-like aggregates formed by entangling fibers are bonded to one side or both sides of a net-like sheet in an entangled state with even said net-like sheet along with entangling between the compositional fibers, many irregular parts are formed in the side of said fiber aggregates, and the compositional fibers of the fiber aggregates entangled on at least one side of said net-like sheet include heat-fusible fibers.

[0013]

In the present invention, the net-like sheet is only contracted and not formed with irregularities in essence, the fiber aggregate is not contracted in essence, and bonded to the net-like sheet so many large irregular parts are formed according to the net-like sheet. The fiber aggregate in the present invention indicates that in which the compositional fibers are entangled and fiber web indicates that which will be entangled.

[0014]

#### Function

The raised sheet of the present invention is arranged with fibers composing of nonwoven fabric-like fiber aggregates in a wave-like raised arrangement, it has a high degree of fiber releasability, and many irregular shapes are bestowed and raised in the sheet as a whole so even relatively large dust such as hair, bread crumbs, etc., is caught and it reliably collects wide range of dust. In the raised sheet of the present invention, the compositional fibers of the fiber aggregate include heat-fusible fibers and said compositional fibers fuse with each other so said compositional fibers do not fall out during cleaning. Also, the net-like sheet and the fiber aggregates are firmly joined in a small joining area according to said heat-fusible fibers without losing the degree of fiber releasability.

[0015]

#### Application examples

Below, application examples of the present invention will be explained while referring to the appended figures. Figure 1 is a cross section showing a state of having superimposed a net-like sheet and fiber web at the beginning of the manufacture of a raised sheet in the first application example of the present invention; Figure 2 is a cross section showing a state of having superimposed a net-like sheet and fiber web at the beginning of the manufacture of a raised sheet in the second application example of the present invention; Figure 3 is a cross section for one example of a completed product of the raised sheet shown in Figure 1; Figure 4 is a cross section for one example of a completed product of the raised sheet shown in Figure 2; Figure 5 is a schematic diagram showing the entire manufacturing device used favorably when manufacturing the raised sheet shown in Figure 4; Figure 6 is a top view of the net used as the net-like sheet; Figure 7 is a top view of the net-like web used as the net-like sheet; Figure 8 is a top view of a film with holes used as the net-like sheet, and Figure 9 is a top view showing a state of having attached a cleaning sheet to a handle-appended tool.

[0016]

First, the raised sheet (10) in the first application example of the present invention shown in Figure 3 will be explained. Raised sheet (10) of this first application example is characterized by the fact that nonwoven fabric-like fiber aggregates (12) formed by entangling fibers are bonded to one side of net-like sheet (11) (13, 14) in an entangled state even with respect to said net-like sheet (11) (13, 14) along with entangling between the compositional fibers, many irregular parts (12A) and (12B) are formed on the side of said fiber aggregate (12), and the compositional fibers of said fiber aggregate (12) include heat-fusible fibers.

[0017]

Said net-like sheet (11) (13, 14) is based on a wide concept including a film having many holes and it includes net (11) shown in Figure 6 and net-like web (13) composed of crimp-manifesting fiber aggregates formed with holes such as that shown in Figure 7 and film (14) having many holes such as that shown in Figure 8.

[0018]

As said net (11) of said net-like sheet, that which is formed into a grid shape as a whole is used as shown in Figure 6, but various modifications in the shape of the holes formed in

net-like sheet (11) (13, 14) are possible. As shown in Figure 8, the shape of the holes in film (14) can be, for example, that star-shaped as shown in (a), round as shown in (b), and a combined round and star shapes as shown in (c).

[0019]

Also, in said fiber aggregates (12), the part not bound to the net-like sheet (11) (13, 14) is convex (12A) and the part bonding with net-like sheet (11) (13, 14) is concave (12B) as shown in Figure 3. Also, irregular cushioning surfaces are formed of said fiber aggregates (12) from many convex parts (12A) and concave parts (12B), which are in between.

[0020]

The side of said fiber aggregate (12) is composed of tangled fibers and when used as a cleaning sheet in particular, fine dust, etc., adhere to the side to be cleaned and are collected between these compositional fibers.

[0021]

As said heat-fusible fiber contained in said fiber aggregate (12) as compositional fiber, fiber containing a component with melting point at least 10°C lower than the melting point of the other compositional fibers of said fiber aggregate (12) is

preferable; for example, core sheath composite fiber with high melting point polymer as the core component and low melting point polymer as the sheath component, side by side composite fiber which joins a high melting point polymer and low melting point polymer, etc., are used. Also, even a low melting point polymer fiber as a single component can be used. As the combination of the high melting point polymer and low melting point polymer composing said composite fiber, polypropylene/polyethylene, polyethylene terephthalate/polyethylene, high melting point polyester/low melting point polyester, etc., can be cited. Also, as the low melting point polymer composing said low melting point polymer fiber, for example, polyethylene, ethylene copolymer, vinyl chloride copolymer, and low melting point polyester can be cited.

[0022]

As said heat-fusible fiber, using that which has a lower melting point than the shrinking temperature of said heat-shrinkable sheet is preferable when using a heat-shrinkable sheet as said net-like sheet (11), (13, 14), and by using said heat-fusible fiber, it is possible to execute fusion of the compositional fibers of said fiber aggregate (12) and bonding of said heat-shrinkable sheet and said fiber aggregates (12) simultaneously with the contraction of said heat-shrinkable sheet when manufacturing raised sheet (10).

[0023]

The content of said heat-fusible fiber in said fiber aggregate (12) is preferably 1-99 wt%, more preferably, 3-70 wt%, and most preferably 5-50 wt%. If the content of said heat-fusible fiber is less than 1 wt%, effect for preventing the falling out of fibers is not sufficient. If it is greater than 99 wt%, the flexibility of the raised sheet, the degree of fiber releasability, and the favorable feeling decrease.

[0024]

As the compositional fiber of said fiber aggregate (12) other than said heat-fusible fiber, for example, synthetic fibers such as polyester fibers, polyamide fibers, polyolefine fibers, acrylic fibers, etc., composite fibers using resins of these fibers, semicomposite fibers such as acetate fibers, regenerated fibers such as cupra, rayon, etc., natural fibers such as cotton, hemp, wool, etc., or mixed cotton can be used.

[0025]

The basis weight of said fiber aggregate (12) and the fineness, fiber length, cross-sectional shape, degree of slippage, and strength of the compositional fiber are determined by giving consideration to the processability, cost, etc., in coordination with the use objective.



[0026]

It is preferable to use that which is heat-shrinkable as net (11) which is said net-like sheet (10), and by using said heat-shrinkable net, it is possible to form many irregular parts on the side of said fiber aggregates due to heat-shrinkable according to heat treatment of said heat-shrinkable net. Said thermal contact net is a net composed of thermoplastic polymer of polyolefines, for example, polyethylene, polypropylene, polybutene, etc., polyesters, for example, polyethylene terephthalate, polybutylene terephthalate, etc., polyamides, for example, nylon 6, nylon 66, etc., acrylonitriles, vinyls, and vinylidenes, for example, polyvinyl chloride, polyvinylidene chloride, etc., or denatured materials thereof, alloys, and mixtures thereof, and a net which was woven or knitted using that which contracts in the uniaxial or biaxial direction according to the irregular shape of the targeted raised sheet or uses a filament of thermoplastic polymer which heat shrinks in at least one of the weft and warp is favorable, and can be suitably selected according to the irregular shape of the targeted raised sheet.

[0027]

As said film (14) having holes as said net-like sheet, a film bestowed with holes according to punching a film of

thermoplastic polymer which contracts in the uniaxial or biaxial direction can be used.

[0028]

As said net-like web (13) comprising said net-like sheet, it is a web composed from a heat-shrinkable fiber of monoolefin polymer and copolymer of ethylene, propylene, butene, etc., ester polymers and copolymers such as polybutylene terephthalate, polyethylene terephthalate, etc., high density polyethylene, low density polyethylene, linear low density polyethylene, polypropylene, ethylene-propylene copolymer, ethylene-vinyl acetate copolymer, etc., vinyl, vinylidene polymers, and copolymers such as polyvinyl chloride, polyvinylidene chloride, etc., polyamide polymers and copolymers such as nylon 6, nylon 66, etc., acrylonitrile polymers and copolymers, or mixtures thereof or inclusive crimp manifestation fibers in which crimping is manifested by heating or mixtures of these fibers, and the web is made into one body in a state of these fibers having been mutually entangled. For example, a fiber aggregate sheet having net-like pattern which contains mutually entangled compositional fibers along with forming a fiber web composed of said compositional fiber into a net shape according to high speed fluid current or air current, a fiber aggregate sheet with perforated holes of specific hole diameter hole pitch, and hole pattern by punching, etc., in a sheet material made into one body

by mutually entangling said compositional fibers, etc., can be used.

[0029]

When using said net (11) as said net-like sheet, it is necessary to determine the hole pattern, hole pitch, hole diameter, interline distance, linear diameter, etc., by giving consideration to the contractive force of net (11), shape and degree of irregular parts (12A) and (12B) formed by shrinking of net (11), and partial entangling with said fiber aggregates (12), but normally the linear diameter is preferably 20-500  $\mu\text{m}$  and more preferably 100-200  $\mu\text{m}$ , and the interline distance is preferably 2-30 mm and more preferably 4-20 mm.

[0030]

When using said net-like web (13) or said perforated film (14) as said net-like sheet, the hole diameter is preferably 4-40 mm and more preferably 8-20 mm and the space between the holes is preferable 2-20 mm and more preferably 4-10 mm. When using that other than the above-mentioned net-like sheet, the hole diameter, etc., can be selected according to said net-like sheet.

[0031]

Next, raised sheet (10) in the second application example of the present invention shown in Figure 4 will be explained. Raised sheet (10) in this second application example is made of arranged fiber aggregates (12) on the both sides of net-like sheet (11) (13, 14) and other than [the fact that] the fiber aggregates (12) are arranged on both sides of the net-like sheet (11) (13, 14), it has the same composition as said first application example.

[0032]

In the case of a raised sheet arranged with fiber aggregates on both sides of a net-like sheet like in this second application example, the fiber aggregates on both sides of the sheet can be the same or different. By using different fiber aggregates on both sides of the sheet, for example, that different content ratios of the heat-fusible fibers or the different types of compositional fibers, can be made into a product capable of differentiating the use objective between the two sides of the sheet or make into a product with different feel between the two sides of the sheet.

[0033]

The raised sheet of the present invention can hold 0.1-500 wt% (fiber aggregate weight reference) of a chemical in the fiber

aggregate. In particular, when using the raised sheet of the present invention as a cleaning sheet, it is preferable that it hold a chemical according to the required function in a suitable fiber aggregate. As this type of chemical, those using oil components as the principal component targeting dry cleaning, and those using detergents targeting wet cleaning can be cited.

[0034]

As said oil components, it is preferable to include at least one out of mineral oil, synethetic oil, silicon oil, and surfactants. As said mineral oil, paraffin hydrocarbon, naphthene hydrocarbon, aromatic hydrocarbon, etc., can be used.

[0035]

As said synthetic oil,, alkyl benzene oil, polyolefin oil, polyglycol oil, etc., can be used. As the silicion oil, linear dimethyl polysiloxane, cyclic dimethyl polysiloxane, methyl hydrodiene polysiloxane, various denatured silicones, etc., can be used.

[0036]

As said surfactant, mono-long-chain alkyl trimethyl ammonium salt, di-long-chain alkyl dimethyl ammonium salt, mono-long-chain alkyl dimethyl benzyl ammonium salt, etc., having alkyl group or

alkenyl group with a carbon number 10-22 can be cited as the cationic type, and polyethylene glycol ethers such as polyoxyethylene (6-35 mol) long-chain alkyl or alkenyl (primary or secondary C8-C22) ether, polyoxyethylene (6-35 mol) alkyl (C8-C18) phenyl ether, etc., polyoxyethylene polyoxypropylene block copolymer, or polyvalent alcohol such as glycerin fatty acid ester, sorbitan fatty acid ester, alkyl glycoside, etc., can be cited as the nonionic type. It is preferable for said surfactant to include less than 5 wt% of water in order to execute cleaning effectively.

[0037]

It is preferable for viscosity (25°C) of said oil component to be 5-1000 cps and 5-200 cps is favorable in particular. When it is less than 5 cps, adsorption of dust is unfavorable and when it is greater than 1000 cps, the oil component does not spread equally on the fibers. Also, the frictional coefficient of the cleaning side increases so it can damage the cleaning side. As the side tension (25°C), it is preferable to be 15-45 dyne/cm and 20-35 dyne/cm is preferable in particular. The reason is that when it is less than 15 dyne/cm, dust adsorption is unfavorable and when it is greater than 45 dyne/cm, it becomes difficult to spread equally on the fibers composing the nonwoven fabric.

[0038]

It is preferable for the holding amount of said oil component to be 0.1-80%, more preferably 0.5-40%, and preferably in particular to be 1-20% with respect to the weight of the fiber aggregate, and it is possible to increase the dust absorption ability and dust-holding ability by holding at this proportion. The reason is that when the holding amount of oil component is less than 0.1%, increase in the dust adsorption and dust holding ability by adding the oil agent is not sufficient and when it is greater than 80%, sticky feeling on the hand becomes unfavorable. The raised sheet of the present invention is formed with irregular parts on the side of the fiber aggregates so even when oil components are held in the fiber aggregates, adhesion of oil components to the hand is minimal and sticky feeling is minimal when contact is made.

[0039]

It is preferable for said oil component to include at least one out of said mineral oil, synthetic oil, and surfactant but the proportion and type thereof, the viscosity, side tension, etc., of said oil can be suitably determined according to the type of compositional fibers in the nonwoven fabric and the cleaning objective. It is also possible to include a disinfectant, fungicide, antibacterial agent, etc., according to necessity in said oil component.

[0040]

As said detergent, it is preferable to be an aqueous solution containing at least one kind of surfactant, solvent, and alkali agent.

[0041]

As said surfactant, various nonionic, cationic, anionic, amphiphatic surfactants, etc., can be cited. As said anionic surfactant, normal sulfonate anionic surfactants and sulfate anionic surfactants are used. As the sulfonate anionic surfactant, there are straight-chain or branched alkyl (C8-C22) benzene sulfate, long-chain alkyl (C8-C22) sulfonate, long-chain olefin (C8-C22) sulfonate, etc. Also, as the sulfate anionic surfactant, there are long-chain monoalkyl (C8-C22) ester sulfate, polyoxyethylene (1-6 mol) long-chain alkyl (C8-C22) ether ester sulfate, polyoxyethylene (1-6 mol) alkyl (C8-C18) phenyl ether ester sulfate, etc. Cations preferable as the counterions of said anionic surfactants are alkali metal ions such as sodium, potassium, etc., alkanolamine ions such as monoethanolamine, diethanolamine, triethanolamine, etc. Sulfonate surfactants are favorable as anionic surfactants from the point of view of the resistance being strong with respect to hydrolysis. Furthermore, long-chain or branched alkyl benzene sulfonate is favorable from the point of view of the cleaning strength. Also, as said amphiphatic surfactant, carbobetaine,



sulfobetaine, and hydroxysulfobetaine having alkyl group of carbon number 8-22 can be cited. Also, as said nonionic surfactant and said cationic surfactants, those similar to surfactants contained in said oil component can be cited. Also, as said solvent, alcohols such as ethanol, isopropanol, etc., glycols such as ethylene glycol, propylene glycol, etc., glycol ethers such as ethylene glycol monoethyl ether, propylene glycol monomethyl ether, etc., can be cited. As said alkali agent, alkanolamine such as monoethanolamine, etc., can be cited. Also, it is possible to include components such as disinfectant, deodorizer, fragrance, etc., to said detergent according to necessity. It is preferable for the holding amount of these detergents to be 50-500% and more preferably to be 100-300% with respect to the weight of the fiber aggregate. By holding at this proportion, it is possible to increase the cleaning effect on dirt, filth, etc. If the holding amount of the detergent is less than 50%, the area capable of being cleaned is too small, and when it exceeds 500%, the cleaning active substance which cannot be held in the sheet may drip out during cleaning.

[0042]

Furthermore, the raised sheet of the present invention can be used as a cleaning product by attaching it to a handle-appended tool in addition to cleaning by directly using the sheet on the hand when using as a cleaning sheet. Handle-appended tool is not restricted in the form thereof in particular but a mop,

handy mop, duster, etc., can be cited and that in which the cleaning part is flat when looking at it macroscopically is favorable. Figure 9 shows one example of said handle-appended tool and code (40) in the figure is the cleaning part thereof. By thus mounting said cleaning sheet to a handle-appended tool, areas hard for the hand to reach such as the ceiling and space between the furniture, etc., can be cleaned with said cleaning sheet and can sufficiently manifest the performance of said cleaning sheet which is superior in holding the captured fine dust, bread crumbs, hair, cotton lint, etc.

[0043]

Said raised sheet of the present invention is manufactured as follows when using, for example, a heat-shrinkable sheet as the net-like sheet. As shown in Figures 1 and 2, after laminating fiber web (12) on one both sides of net-like sheet (11) (13, 14) which heat shrinks thermally in the uniaxial or biaxial direction, fibers of fiber web (12) on one side of net-like sheet (11) (13, 14) and fibers of fiber web (12) on the other side and the fibers of fiber web (12) and net-like sheet (11) (13, 14) are made into one body from being entangled by water jet. At the same time, fiber webs (12) and (12) are made into nonwoven fabric-like fiber aggregates by entangling. Thereafter, by heat shrinking net-like sheet (11) (13, 14) which has heat-shrinking property simultaneous with drying of the obtained fiber aggregate or separate from the drying process, irregular shape is bestowed as

a whole by raising the compositional fibers in said nonwoven fabric-like fiber aggregate into a wave shape.

[0044]

Namely, as shown Figure 5 fiber web (12) is delivered continuously from carding machines (21A) and (21B) which create fiber web (12) via delivery device (22). On the other hand, roll (23) of net-like sheet (11) (13, 14) is arranged between carding machines (21A) and (21B) and net-like sheet (11) (13, 14) is delivered from delivery roll (25) of roll (23).

[0045]

Then fiber web (12) is superimposed on both sides of net-like sheet (11) (13, 14) with said delivery roll (22) then transported to water needling device (26). Here, the fibers of fiber web (12) are entangled with the net-like sheet by water jet, fiber aggregates (12) on both sides of net-like sheet (11) (13, 14) are entangled, and the sheet shown in Figure 2 is fabricated.

[0046]

Fiber aggregate (12) and net-like sheet (11) (13, 14) after the entangling are transported to heater (28) to execute drying and heat-shrinking via nip roll (27) and is heat treated. Net-

like sheet (11) (13, 14) is thermally contracted by this heat treatment and convex parts (12A) and concave parts (12B) are formed to nonwoven fabric-like fiber aggregate (12) which was entangled in net-like sheet (11) (13, 14) for example, as shown in Figure 4. In the heating process with heater (28), nonwoven fabric-like fiber aggregate (12) and heat shrinkable net-like sheet (11) (13, 14) are made into one body after treatment at a suitable temperature · time. The conditions thereof differ according to net-like sheet (11), (13, 14) which has heat-shrinkable property but use a shrinkage factor for obtaining the necessary irregular shapes. However, the speed difference between the inlet side and outlet side of the heat treatment part becomes an important factor in a continuously joined sheet when contracting in the flow direction of the sheet. Namely, when the shrinking stress is greater than the stretching force, it is preferable to conform the speed ratio at the front and rear to be close to the necessary shrinkage factor.

[0047]

When holding a chemical in the fiber aggregate of the raised sheet, the method is not restricted in particular and is delivered, for example, by spray device (31) arranged between nip roll (29) and winder (30) as shown in Figure 5. Delivery of chemical can be executed prior to the heat treatment or after the heat treatment, but when executing before the heat treatment it is preferable to provide a supplementary dryer between nip roll

(27) and heater (28) to hold the chemical after drying with this device. In particular, when using a detergent as the chemical, it is preferable to execute after the heat treatment.

[0048]

When the raised sheet is a continuous sheet, it can be wound into a roll shape or continuously cut into the necessary length, then folded and packaged according to necessity. The raised sheet after being impregnated with chemical is wound on winder (30) via nip roll (29).

[0049]

In a case of having laminated fiber web (12) on one side of net-like sheet (11) (13, 14) as in Figure 1, a case of irregular side being formed as a whole by convex parts (12A) being formed randomly on both sides of net-like sheet (11), (13, 14) is a general practice in addition to a case of convex parts (12A) being formed only on one side of net-like sheet (11) (13, 14) as shown in Figure 3 when nonjoining part with net-like sheet (11) (13, 14) is formed as convex parts (12A), and similarly, even in a case of having laminated fiber web (12) on both sides of net-like sheet (11), (13, 14) as shown in Figure 2, convex parts (12A) are formed on one side of the sheet by convex parts (12A) projected from both sides of net-like sheet (11) (13, 14) in Figure 4 becoming one body if compositional fibers between the fiber

aggregates arranged on both sides of net-like sheet (11) (13, 14) are entangled even in the nonjoining part with net-like sheet (11) (13, 14), convex parts (12A) are formed randomly on both sides of net-like sheet (11) (13, 14), and irregular side is formed as a whole, and these are included in the application example of the present invention.

[0050]

Also, when using a film having holes as the net-like sheet, if a sheet with small holes or high thickness is used, the fiber aggregates existing on the front and back sides mutually entangle strongly by passing through the holes and the fibers on the grid or on the film do not entangle easily with the perforated film or net, so contrary to the above case, irregularities are formed by the fibers on the grid or on the film being raised downward. In particular, if a net is used as the net-like sheet and fiber aggregates are laminated and entangled on both sides of the sheet, the fibers of the fiber aggregates mutually entangle strongly by interposing the holes of the net so there is a tendency to form concave parts easily.

[0051]

Furthermore, the raised sheet of the present invention will be explained based on concrete application examples.

(Application Product 1: Identical fiber aggregates arranged on both sides of a net-like sheet) Using mixed polyester fiber of 1.5 d, 51 mm and polypropylene/polyethylene core sheath fiber of 3 d, 51 mm in weight ratio of polyester fiber/core sheath fiber = 7/3, fiber web of basis weight 10 g/m<sup>2</sup> was formed with a normal carding machine; the fiber web was wrapped (not shown in the figure) in three layers (30 g/m<sup>2</sup>), and after laminating said fiber web on the top and bottom layers with net (5 mesh/linear diameter 0.2 mm) of polypropylene as a net-like sheet which biaxially shrinks as the middle layer, entangling was executed according to water needling. At this time, the water needling was executed at water pressure 40 kg/cm<sup>2</sup>, nozzle pitch 1.6 mm, and speed 5 m/min. After shrinking the net simultaneous with the drying by executing heat treatment for 50 sec with hot air of 130°C thereafter, oil component (viscosity 125 cps, side tension 30 dyne/cm) composed of liquid paraffin 95% and nonionic surfactant [polyoxyethylene (average add mole count 3.3.) alkyl (C12-C13) ether] 5% was bestowed in proportion of 5% with respect to the fiber weight by spraying, and Application Product 1 having irregularities on a side with area shrinkage factor of 20% was obtained.

[0052]

The area shrinkage factor is computed with following equation (1).

[0053]

## Mathematical Formula 1

$$\text{Area shrinkage factor (\%)} = 100 - A \times B \times 100 \quad (1)$$

However, A and B are as follows.

A = (length of one side after heat shrinking in the vertical direction)/(length of one side before heat shrinking in the vertical direction)

B = (length of one side after heat shrinking in the horizontal direction)/length of one side before heat shrinking in the horizontal direction)

[0054]

(Application Product 2: Different fiber aggregates arranged on both sides of a net-like sheet) Other than using mixed polyester of fiber 3 d, 51 mm and polypropylene/polyethylene core sheath of fiber 3 d, 51 mm in weight ratio of polyester fiber/core sheath fiber = 3/7 as the source material of the top layer fiber web, and using it mixed in weight ratio of said polyester fiber/said core sheath fiber = 7/3 as the source material of the bottom layer fiber web, Application Product 2 (area shrinkage factor 20%) was obtained in the same manner as in the case of Application Product 1.



{0055}

(Comparative Product 1: Fiber aggregate without heat-fusible fibers) Other than using only polyester fiber of 1.5 d, 51 mm as the source material for the top and bottom layer fiber web, Comparative Product 1 was obtained in the same manner as in the case of Application Products 1.

{0056}

(Comparative Product 2: Fiber aggregate composed only of heat-fusible fibers) Other than using only polypropylene/polyethylene core sheath fiber 3 d, 51 mm as the source material for the top and bottom layer fiber web, Comparative Product 2 was obtained in the same manner as Application Product 1.

{0057}

The following evaluation was executed with regards to said application products and comparative products.

1. Hair-capturing property

About 10 cm of human hair were dispersed so that 10 strands are not superimposed densely, that which adhered and fixed to said applied products and comparative products on a sponge having size of 7 x 11 cm which was rubbed over it three times, and

functional evaluation regarding the ease in capturing the hair and difficulty in falling off was executed.

[0058]

The criteria for functional evaluation were as follows.

◎: 10-8 strands of hair are captured reliably and the captured strands of hair do not fall off easily.

○: 10-8 strands of hair are captured reliably but the captured strands of hair sometimes fall off.

—: 7-5 strands of hair are captured but the captured strands of hair fall off easily.

x: Does not capture more than 5 strands of hair.

[0059]

## 2. Side fiber fallout resistance

On said application products and comparative products of 15 x 15 cm, after having executed 10 cycles, with positive rotation and negative rotation as one cycle so that the center of the disc-shaped sponge depicts a circle of radius 4 cm at 1 sec/1 rotation, by applying load of 500 g to a disc-shaped sponge (product of Oe, Kintori Cleaner No. 5005) with 7 cm diameter, and 2 cm thickness, visual judgment was made on the fiber count adhered to the disc-shaped sponge.

[0060]

Evaluation standard for the judgment was as follows.

⊙: No fibers are adhered.

○: Hardly any fibers are adhered.

△: Fibers are adhered at the outer circumference of the disc.

[0061]

Said evaluated results are shown in Table I below.

[0062]

Table I

		① 髪のも捕集性	② 表面耐毛羽抜け性
③ 実施品	1	○	⊙
	2	⑤ ○ / ⊙ ⑥ (上層) (下層)	③ ⊙ / ○ ④ (上層) (下層)
④ 比較品	1	○	△
	2	×	⊙

Key: 1      Hair-capturing property  
      2      Side fiber fallout property  
      3      Application product  
      4      Comparative product  
      5      Top layer  
      6      Bottom layer

[0063]

As apparent from Table I, Application products 1 and 2, which are the raised sheets of the present invention, have favorable hair-capturing property and fiber fallout resistance. On the contrary, Comparative Products 1 and 2 do not have satisfactory hair-capturing property and fiber fallout resistance. In particular, Comparative Product 2 has unfavorable hair capturing property and is unsuitable as a cleaning product.

[0064]

The raised sheet of the present invention is not restricted by the aforementioned application examples, and the application thereof is not restricted to cleaning sheet; it can be applied to cushion material or side material for sanitary napkin, wiping material, etc., and the chemical held according to necessity can be suitably selected according to use.

[0065]

#### Effect of the invention

The raised sheet of the present invention has superior adsorption ability and ability to hold dirt such as fine dust, etc., superior ability to capture hair, pieces of thread, cotton dust, etc., resulting from the entangling of fibers in a nonwoven fabric of high fiber releasability and to capture large dirt such as bread crumbs, etc., utilizing the irregularities of the nonwoven fabric, superior fiber fallout resistance, favorable flexibility, and it is favorable as a cleaning sheet, etc.

#### Brief description of the figures

Figure 1. Figure 1 is a cross section showing a state of having superimposed a net-like sheet and fiber web at the beginning of the manufacture of a raised sheet in the first application example of the present invention.

Figure 2. Figure 2 is a cross section showing a state of having superimposed a net-like sheet and fiber web at the beginning of the manufacture of a raised sheet in the second application example of the present invention.

Figure 3. Figure 3 is a cross section figure for one example of a completed product of the raised sheet shown in Figure 1.

Figure 4. Figure 4 is a sectional figure for one example of a completed product of the raised sheet shown in Figure 2.

Figure 5. Figure 5 is a schematic diagram showing the entire manufacturing device used favorably when manufacturing the raised sheet shown in Figure 4.

Figure 6. Figure 6 is a top view of the net used as the net-like sheet.

Figure 7. Figure 7 is a top view of the net-like web used as the net-like sheet.

Figure 8. Figure 8 is a top view of a film with holes used as the net-like sheet.

Figure 9. Figure 9 is a top view showing a state of having attached a cleaning sheet to a handle appended tool.

#### Explanation of symbols

- (10)...raised sheet,
- (11), (13, 14)...net-like sheet,
- (12)...fiber aggregate (or fiber web),
- (12A)...convex part,
- (12B)...concave part.

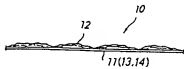


Figure 1

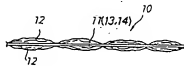


Figure 2

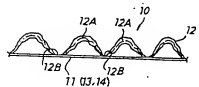


Figure 3

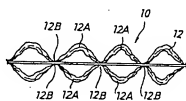


Figure 4

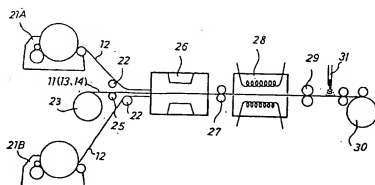


Figure 5

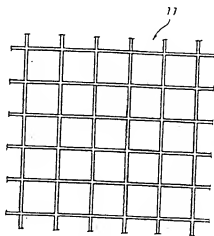


Figure 6

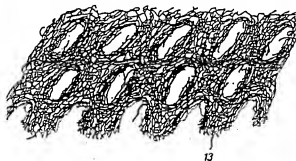


Figure 7



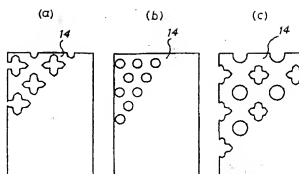


Figure 8

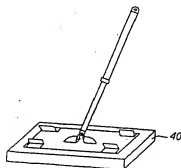


Figure 9